Remarks

Claims 16 to 35 are pending. Claims 1 to 15, and 17 have been canceled. Claims 16, 18 and 19 are amended. Claims 36 to 44 have been added.

Claim 16 has been amended to incorporate the limitation of claim 17.

Please cancel claim 17.

Claims 18 and 19 have been amended to depend from claim 16. Support for these amendments can be found in claims 16-19 as previously presented.

Support for new claim 36 can be found in claims 16 and 21, as previously presented.

Support for new claims 37-40 can be found in previously presented claims 20 and 25, claims 20 and 26, claim 27, and claim 18, respectively.

Support for new claim 41 can be found in previously presented claims 16 and 27.

Support for new claims 42-44 can be found in previously presented claims 20 and 25, claim 26, and claim 17, respectively.

§ 103 Rejections

Claims 16-35 stands rejected under 35 USC § 103(a) as being unpatentable over Kaufman, et al. (US 5,954,997) in view of Hudson (US 5,972,792) or in view of Hirabayashi, et al. (US 5,575,885).

In one embodiment, the present invention provides a working liquid useful in modifying a surface of a wafer suited for fabrication of a semiconductor device. The working liquid is an aqueous solution of initial components substantially free of loose abrasive particles. The components comprise an oxidizing agent, a complexing agent, a passivating agent, and a buffer. (See, amended claim 16.)

The Patent Office asserts that Kaufman describes a CMP slurry which includes all three agents previously recited (e.g., an oxidizing agent, a complexing agent, and a passivating agent.) The Patent Office, citing col. 6, lines 46-50, further asserts that Kaufman teaches other additives such as stabilizer may be used.

Kaufman teaches that film forming agents may destabilize the uniform dispersion of abrasive in the slurry. (See, col. 6, lines 32-34.) Applicant submits that, when discussing other additives, Kaufman is referring to additives that are effective at achieving stabilization of the slurry. (See, col. 6, lines 34-50.) If, as the Patent Office asserts, it would be obvious to remove the abrasive particles from the slurry of Kaufman, there would be no motivation to use the additives of Kaufman.

Kaufman describes maintaining the pH of the slurry within the range of 2.0 to 12.0 (preferably 4.0 to 9.0) in order to facilitate control of the CMP process, noting that slurry handling and polishing quality problems result when the pH is too low. (See, col. 8, lines 22-28.) Kaufman describes the use of acids, bases or amines to adjust the pH. (See, col. 8, lines 28-34.)

Applicant submits that Kaufman does not describe, teach or suggest the use of a buffer as required in the present invention. (See, claim 16 as amended.) Nor does Kaufman describe, teach or suggest ionic buffers as provided in claim 18 or the specific buffers provided in claim 19.

The Patent Office relied on Hudson and/or Hirabayashi for their purported teaching that polishing solutions can be used with or without particles. (See, Paper No. 13, page 3, lines 7-11.) Applicants submit that neither Hudson nor Hirabayashi describe, teach or suggest the use of a buffer. Hirabayashi describes adjusting the pH by using an alkaline agent such as potassium hydroxide and quinoline. (See, col. 4, lines 55-59. See, also, col. 7, line 64-66; and Fig. 7 with its description at col. 8, lines 4-13 (wherein the pH is adjusted solely by the addition of potassium hydroxide.)) Hudson also describes adjusting the pH (see, e.g., col. 4, lines 52-65), but Hudson does not describe, teach or suggest the use of buffers.

For at least this reason, the rejection of claim 16 under 35 USC § 103(a) as being unpatentable over Kaufman, et al. in view of Hudson or in view of Hirabayashi, et al.

Claims 18-35 each add additional features to claim 16. Claim 16 is patentable for the reasons given above. Thus, claims 18-35 are likewise be patentable.

Claim 17 has been canceled.

In summary, the rejection of claims 16-35 under 35 USC § 103(a) as being unpatentable over Kaufman, et al. in view of Hudson or in view of Hirabayashi, et al. has been overcome and should be withdrawn.

In another embodiment, the present invention provides a working liquid useful in modifying a surface of a wafer suited for fabrication of a semiconductor device. The liquid is aqueous solution of initial components substantially free of loose abrasive particles. The components comprise an oxidizing agent, a complexing agent, and a passivating agent. The oxidizing agent comprises a material selected from the group consisting of nitric acid, sulfuric acid, chromic-sulfuric acids, coordination compounds, halogen oxo acids, salts of halogen oxo acids, ammonium persulfates, sodium persulfates, potassium persulfates and combinations thereof. (See, new independent claim 36 and dependent claims 37-40.)

The Patent Office asserts that Kaufman describes a CMP slurry which includes an oxidizing agent, a complexing agent, and a passivating agent.

Kaufman describes oxidizing agents that may be selected from compounds that, upon reduction, form hydroxyl radicals. (See, col. 5, lines 28-30.) Kaufman specifically describes peracetic acid, urea-hydrogen peroxide, and hydrogen peroxide as hydroxyl radical forming oxidizers. (See, col. 5, lines 34-36.) Thus, applicant submits that Kaufman does not describe, teach or suggest the oxidizers of the present invention. (See, new claim 36.)

As previously discussed, the Patent Office relied on Hudson and/or Hirabayashi for their purported teaching that polishing solutions can be used with or without particles. In addition, the Patent Office acknowledged that Hudson was not relied upon for the solutions taught by Hudson, which are varied depending on the metal to be polished. (See, Paper No. 13, page 2, lines 8-10.) Applicants submit that neither Hudson nor Hirabayashi describe, teach or suggest a working liquid that is substantially free of loose abrasive particles and comprises an oxidizing agent, a complexing agent, and a passivating agent.

For at least this reason, new claims 36-40 should be allowed.

In another embodiment, the present invention provides a working liquid useful in modifying a surface of a wafer suited for fabrication of a semiconductor device. The liquid is

aqueous solution of initial components substantially free of loose abrasive particles. The components comprise an oxidizing agent, a complexing agent, and a passivating agent. The passivating agent comprises a material selected form the group consisting of tolytriazole, cuprous oxide, phosphates, alkene oxide condensation products of fatty acid polyamides, 4-alkylpyrocatechols, amine borates, β-(o-carboxybenzylthio) propionitrile, chromate ion, cobalt lineolate, dicyclohexylammonium nitrite, egg albumin, formaldehyde, hexamethyleneamine nitrobenzoates, hydrazine, naphthenic acids, organosilicon compounds, propargyl alcohol, sodium adipate, sodium arsenite, sodium benzoate, sodium nitrite, sodium oleate, sodium sulfite, high molecular weight sulfur compounds, triethanolamine phosphate, $Na_6P_4O_{13}$, and combinations thereof. (See, new independent claim 41 and dependent claims 42-44.)

The Patent Office asserts that Kaufman describes a CMP slurry which includes an oxidizing agent, a complexing agent, and a passivating agent. Kaufman specifically describes the following useful film forming agents: benzotriazole, benzimidazole, and benzothiazole and their derivatives with hydroxyl, amino, imino, carboxy, mercapto, nitro and alkyl substituted groups, as well as urea and thiourea. (See, col. 5, lines 50-55.) Thus, Kaufman does not describe, teach or suggest the passivation agents of the present invention. (See, claim 41.)

For at least this reason, claims 41-44 should be allowed.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested.

Allowance of claims 16, and 18-35, as amended, and new claims 36-44 at an early date is solicited.

2 September, 2003
Date

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